## Remarks

Claims 1-5 and 7-20 have again been rejected under 35 U.S.C. §103(a) as being unpatentable over Hartley et al., U.S. Patent No. 4,853,737 ("Hartley) and, incorporated by reference, Lentz, U.S. Patent No. 4,257,699 ("Lentz") in view of Schlueter, Jr. et al., U.S. Patent No. 5,995,796 ("Schlueter"), Kirk-Othmer, "Elastomers, Polyisoprene to Expert Systems," *Encyclopedia of Chemical Technology*, pp. 16-20, 22-25 (4th Ed., Vol. 9, John Wiley & Sons, 1994) ("Kirk"), and Lewis, *Hawley's Condensed Chemical Dictionary*, pp. 437, 1097 (13th Ed., Van Nostrand Reinhold Publ., 1997) ("Lewis").

Claims 1-5 and 7-22 have again been rejected under 35 U.S.C. §103(a) as being unpatentable over Hartley in view of Schlueter, Blong et al., U.S. Patent No. 5,527,858. ("Blong"), Kirk, and Lewis.

Claims 1-5 and 7-20 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Hartley and, incorporated by reference, Lentz in view of Schlueter, and further in view of Friedman et al., U.S. Patent No. 5,908,704 ("Friedman").

Claims 1-5 and 7-22 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Hartley in view of Schlueter and Blong, and further in view of Friedman.

Claims 1-5 and 7-20 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Hartley and, incorporated by reference, Lentz in view of Schlueter, and further in view of applicants' admitted state of art and Thullen et al., U.S. Publication No. 2003/0232207 ("Thullen").

Claims 1-5 and 7-22 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Hartley in view of Schlueter and Blong, and further in view of applicants' admitted state of art and Thullen.

All of the foregoing rejections are respectfully traversed.

Hartley, the primary reference cited in the rejection of the claims of the instant application, discloses a fuser roll having an outer layer that comprises cured fluorooelastomer having pendant polydiorganosiloxane segments that are covalently bonded to the fluoroelastomer backbone. DuPont Viton® A and Viton® B are cited as suitable fluoroelastomer base polymers. Lentz and Schlueter, and Eddy et al., U.S. Patent No. 5,017,432 ("Eddy") also disclose compositions containing cured fluoroelastomers such as Viton® A and Viton® B.

Hartley, Lentz, and Schlueter, all of which disclose Viton® fluoroelastomers, are cited in the rejection of the instant claims, which are directed to compositions containing fluorocarbon thermoplastic random copolymers such as Dyneon™ THV fluorothermoplastics. In both the previous and present Office Actions, the Examiner has repeatedly remarked that Hartley does not expressly show that the disclosed fluoroelastomers are thermoplastic. In response, the applicants have continued to assert that Hartley does not expressly teach that cured fluoroelastomers are thermoplastic because they are, in fact, not thermoplastic.

In an effort to provide convincing evidence that fluoroelastomers and fluorocarbon thermoplastic random copolymers, even if formed from the same monomers and of similar chemical composition, are well recognized both in the patent prior art and in commercialized polymer technology as distinct classes of materials, the applicants enclosed with their previously filed Request for Continued Examination an extensive series of Attachments (A, B, C, D, E, F, G, H, J, K, L, M, N, O) relating to fluoroelastomers, fluorothermoplastics, and blends thereof. Regrettably, the recent Office Action provides scant evidence of the Examiner's full consideration of the applicants' arguments supported by these references, which are now of record in the event of appeal.

As is well known, Viton® B is a commercial fluoroelastomer, long available from DuPont, that is formed from the monomers tetrafluoroethylene (TFE), hexafluoropropylene (HFP), and vinylidene fluoride (VDF). Dyneon™ THV is a family of commercial melt-processable fluorothermoplastic terpolymers, characterized by melting points in the range of 120-250°C and formed from the same three monomers, **T**FE, **H**FP and **VD**F, as Viton® B. Because of the three monomers employed in its formation, a fluoroelastomer such as Viton® B is occasionally referred to as a "THV" fluoropolymer, which leads to confusion with fluorothermoplastics such as, for example, Dyneon™ THV 200 and THV 500.

Attached as **Attachment P** are pages, numbered P-1 through P-9, from the Dyneon™ internet website. On P-1 is listed "The Dyneon Product Portfolio," which includes "Dyneon™ PFA, ETFE, FEP, THV,THE Fluorothermoplastics" and "Dyneon™ Fluoroelastomers." Pages P-2 to P-5 are Frequently Asked Questions (FAQs) about Dyneon™ Fluorothermoplastics (FTPs), including Dyneon™ THV products. Pages P-6 to P-9 are Frequently Asked Questions (FAQs) about Dyneon™ Elastomers, including fluoroelastomers. (Information about DuPont Dow Viton®

Fluoroelastomers, including Viton® B, can be found in previously filed **Attachment B**). Thus, both fluorothermoplastic THV and fluoroelastomeric commercial products are available from Dyneon; similar products are available from other suppliers such as DuPont.

On page 10 of the Office Action, in response to the applicants' argument that fluoroelastomers such as Viton® B and fluorothermoplastics such as THV have demonstrably different properties, the Examiner cited several references in support of her disagreement with that argument. The first of these, "Comparison of DuPont Dow Viton® Fluoroelastomers" (applicants' **Attachment B**) was cited because Viton® B is stated therein to be processable by injection molding, extrusion, and calendaring. On that basis, the examiner concluded that "Viton® B has properties of thermoplastic materials." The applicants have no inclination to dispute the manufacturer's assertion in **Attachment B** that there "is a full range of Viton® B grades that accommodate a variety of processes including injection and compression molding, extrusion, and calendaring." Nonetheless, cured Viton® B fluorelastomers are rubbery materials, in contrast to THV fluorothermoplastics, which are melt-processable and have well-defined melting ranges.

Also on page 10 of the Office Action, the Examiner asserted that both "VITON and THV fluoropolymers are **fluoroelastomers**," citing the Abstract of Gilbert et al., U.S. Publication No. 2002/0001543 ("Gilbert"). The applicants, noting the disclosure of enclosed **Attachment P**, *inter alia*, respectfully disagree.

The Abstract of Gilbert lists several plastics and mixtures thereof, including the following: "fluoroelastomers, such as THV,..." Page 1, [0007], however, recites that "fluoroelastomers such as VITON (registered trademark of Dupont de Nemours) (hexafluoropropylene-vinylidene fluoride copolymer), or hexafluoropropylene-vinylidene fluoride-tetrafluoropropylene THV terpolymers, or tetrafluoroethyle-hexafluoropropylene-treated vinylidene fluoride," The first listed fluoroelastomer is Viton® A, and it is highly likely that the second listed fluorelastomeric "THV" terpolymer refers to Viton® B, or a close analog thereof. This is almost certainly an instance, as discussed above, of a terpolymeric fluoroelastomer such as Viton® B being described as a "THV" fluoropolymer on the basis of its three component monomers, and the consequent confusion with terpolymeric fluorothermoplastics such as Dyneon™ THV 200 and THV 500.

Also on page 10 of the Office Action, the Examiner stated that "it is well known in the art that thermoplastic can be fluoroelastomer and fluoroelastomer can be thermoplastic." As support for this remarkable assertion, the Examiner cited the disclosure of Shifman '873 that "**thermoplastic fluoroelastomers** are known and include terpolymers of hexafluoropropylene-vinylidene fluoride-tetrafluoroethylene (not a blend of thermoplastic and fluoroelastomer) (see column 6, lines 31-42)."

In their Remarks in the Request for Continued Examination, the applicants discussed this portion of Shifman '873 as follows:

"Shifman '873, at column 6, lines 31-43, discloses further embodiments, illustrated in FIGS. 2 and 3, that include an elastomeric inner tubular layer 12. The elastomer employed in layer 12 is selected from the "group consisting of nitrile rubber (NBR), thermoplastic fluoroelastomer, such as hexafluoropropylene vinylidene copolymers or hexafluorenopropylene (*sic*)-vinylidene fluoride-tetrafluoroethylene terpolymers, polyvinyl chloride, and blends thereof. Preferably, the elastomeric, inner tubular layer is conductive NBR such as butadiene-acrylonitrile rubber."

The foregoing quotation contains the sole occurrence in Shifman '873 of the term "thermoplastic fluoroelastomer." As taught by Kirk, thermoplastic elastomers are typically multiphase systems containing thermodynamically incompatible mixtures of a hard polymer that becomes fluid on heating and a softer material that is rubberlike at room temperature. These two types of materials may be chemically combined into the same molecule by block or graft copolymerization, or they may be produced by mechanically mixing a hard thermoplastic with a softer, more rubberlike polymer. It is also sometimes possible to produce the rubber component *in situ* during polymerization. On page 25 of Kirk, to which special attention was drawn in the Office Action, it is stated: "The production of the hard polymer/elastomer combinations is more simple.... In some cases, the components are technologically compatibilized by use of a grafting reaction, but usually a fine dispersion of the two phases is formed that is sufficient to give the product the properties of a thermoplastic elastomer."

Thus, Kirk teaches that thermoplastic elastomers are typically formed by the mechanical mixing, i.e., blending, of separate thermoplastic and elastomeric polymers. Such blending is disclosed in Shifman '873 at column 6, lines 24-29, which describes barrier layer 10 as being formed from a fluoroelastomer: fluorothermoplastic blend, i.e., a thermoplastic fluoroelastomer, in a weight ratio of

about 70:30. Also as previously noted, blends of hard and soft polymeric components are described in Blong and in Effenberger et al., U.S. Patent No. 5,194,335 ("Effenberger"), cited in the July 17, 2002 Office Action.

Clearly, the applicants are knowledgeable in regard to the type of polymeric materials known in the art as thermoplastic fluoroelastomers, and, in fact, their previously filed **Attachment G** describes a commercially available product, DAI-EL, which consists of connected soft fluoroelastomer and hard fluororesin segments. However, given that thermoplastic fluoroelastomers are not disclosed in either the instant application or in the cited prior art Hartley, Lentz, and Schlueter, the applicants believe they are only marginally relevant to this case.

Also in support of her position that a thermoplastic can be a fluoroelastomer and vice-versa, the Examiner stated that commercially available THV fluoropolymers (3M/Hoechst), which the applicants maintain are fluorocarbon thermoplastic random copolymers, are described in Thullen as thermoplastic fluorinated elastomers.

Thullen, which discloses a wide variety of thermoplastic adhesion-modified elastomer (TPE) compositions as molding materials, recites, at page 5, [80], that

"Thermoplastic fluorinated elastomers on the market are, for example, THV (3M/Hoechst), a PTFE-HFP-PVDF-Compound." This characterization as fluorelastomers of the THV fluoropolymers developed by Hoechst and now available from Dyneon, a 3M company, (cf. **Attachment P**) is clearly incorrect. The opening paragraph of the previously filed **Attachment C** ("THV Fluoroplastic") states:

"In the early 1980s Hoechst AG developed a commercial production process for a unique melt processable fluoroplastic consisting of tetrafluoroethylene, hexafluoropropylene, and vinylidene fluoride.... In January 1993 Hoechst granted worldwide marketing rights to 3M and the product reached full commercial status under the name 3M™ THV Fluoroplastic. With the start-up of the Dyneon 3M/Hoechst joint venture in August 1996, the product is now known as Dyneon™ THV fluorothermoplastic." (emphasis added)

On the basis of the foregoing discussion, it is clear that the cited disclosure of Thullen cannot be relied on as an accurate description of Dyneon™ THV fluorothermoplastic materials.

Two of the new §103(a) rejections of the claims include the disclosure of Friedman, specifically that of column 2, lines 52-65:

"The fluorocarbon film comprises at least 85 weight % of THV polymer: a thermoplastic elastomer terpolymer containing segments of tetrafluororethylene (ECTFE), hexafluoropropylene (HFP), and vinylidene fluoride (VDF). The THV polymers and various methods for manufacturing them are described in U.S. Pat. Nos. 3,235,537, 3,132,123, 3,635,926, 3,528,954, 3,642,742, and 4,029,868, the contents of which are hereby incorporated by reference. The THV polymers are block or graft copolymers consisting of an elastomeric soft segment (i.e., hexafluoropropylene and vinylidene fluoride) and a fluoroplastic hard segment (i.e., tetrafluoroethylene). The preferred THV polymers are commercially available polymers comprising a molar ratio of ECTFE:HFP:VDF of about 42-60:20-18:38-22."

At column 4, lines 4-9, of Friedman, it is further stated:

"The THV resins preferred in the invention include resin grade molecular weights ranging from 200,000 (THV-200G polymer, obtained from obtained from Dyneon, a joint venture of 3M Corporation and Hoechst Corp., Minneapolis, Minn.) to 500,000 (THV-500G polymer from Dyneon)."

It should be mentioned at the outset that the six patents cited and incorporated by reference in Friedman do not describe THV polymers and various methods for manufacturing them, but instead relate primarily to prefluorovinyl ether copolymers.

More important, Friedman describes commercial THV resins such as THV-200G from Dyneon polymers as being block or graft copolymers consisting of an elastomeric soft segment and a fluoroplastic hard segment. Believing this to be a mischaracterization of Dyneon THV polymers, the applicants' agent, Lee J. Fleckenstein, sent the following e-mail to Dyneon Customer Assistance:

U.S. Patent No. 5,908,704 describes THV polymers as being thermoplastic elastomer terpolymers,i.e., block or graft copolymers consisting of an elastomeric soft segment (HFP-VF) and a fluoroplastic hard segment (TFE).

Your website describes THV products as fluoroplastics and separately refers to your fluoroelastomer products. Are THV polymers thermoplastic elastomers, as described in the referenced patent?

Thank you for your assistance.

The following response was received from Jim Hobensack, Dyneon Customer Assistance:

THV is Dyneon's tradename for terpolymers of VDF, HFP and TFE polymers that are commercially available are fluoroplastics. If the monomers are combined in the right ratios then they could be fluoroelastomers.

Dyneon separates its business into three distinct parts-two of which are Fluoroplastics and Elastomers. Elastomers containing these

monomers are not called THV but are available through the Elastomers Group of Dyneon.

The preceding inquiry and response, which is included in **Attachment Q**, confirms that Dyneon® THV fluoropolymers are indeed fluoroplastics, not fluoroelastomeric block or graft copolymers, as incorrectly asserted by Friedman.

The applicants offer the following additional references in a further effort to convince the Examiner that fluoroelastomers and fluorothermoplastics are recognized in the patent prior art and in commercialized polymer technology as distinct classes of materials having substantially differing characteristics:

Chen et al., U.S. Patent No. 6,361,829 ("Chen '829"), a copy of which is enclosed as **Attachment R**, is one of the eight previously mentioned closely related patents issuing from applications filed June 30, 2000, the same date as that of the instant application. Chen '829 discloses a method of forming a fuser member using a coating composition that includes a fluorocarbon thermoplastic random copolymer having subunits of:

$$—(CH_2\,CF_2)x—,\ —(CF_2CF(CF_3)y—,\ \text{and}\ —(CF_2\,CF_2)z—,$$

wherein x is from 1 to 50 or 60 to 80 mole percent, y is from 10 to 90 mole percent, z is from 10 to 90 mole percent, and x + y + z equals 100 mole percent.

In illustrative Examples 1-3, the coating composition contains the fluorocarbon thermoplastic random copolymer TV 200A, sold by 3M (cf. column 10, lines 60-65). In Comparative Examples 3-5, the fluorocarbon thermoplastic random copolymer TV 200A is replaced with Viton® A fluoroelastomer. Incidentally, these same illustrative examples utilizing, respectively, THV 200A and Viton®, are also included in three other related patents issuing from applications filed June 30, 2000: U.S. Patent Nos. 6,429,249, 6,444,741, and 6,696,158.

Chen et al., U.S. Patent No. 6,310,141 ("Chen '141), assigned to Dyneon LLC, a copy of which is enclosed as **Attachment S**, describes "compositions that combine the flexibility, low temperature properties, and processability of fluoroelastomers with the low vapor permeation associated with higher melting fluoroplastics." (cf column 1, lines 57-60). In one embodiment, the fluoroelastomer includes the reaction product of 20-60 wt.% TFE, 10-40 wt.% VDF, and 30-50 wt.% HFP (cf. column 2, lines 10-13). Examples of suitable fluoroplastics include TFE-HFP-VDF terpolymers having melting points ranging from 100-260°C (cf. column 2, lines 31-34), which are

commercially available under the designation "THV" from Dyneon Corporation (cf. column 4, lines 22-25).

Duchesne et al., U.S. Patent No. 6,242,548 ("Duchesne"), assigned to Dyneon LLC, a copy of which is enclosed as **Attachment T**, describes THV fluoropolymers as follows:

Partially crystalline fluoroplastic terpolymers of tetrafluoroethylene (TFE), vinylidene fluoride (VDF), and hexafluoropropylene (HFP) are available from Dyneon LLC and Dyneon GmbH under the name "Dyneon™ THV". These fluoroplastic materials and their wide range of uses is described in more detail in "Modern Fluoropolymers", Wiley, 1997, p. 257. They typically are derived from monomer compositions comprising from 30-70 wt. % TFE, 5-40 wt. % HFP, and 5-55 wt. % VDF and have a melting point range of 75°C to 275°C. (cf. column 1, lines 14-23).

Please note the overlapping weight percentage ranges of the component monomers TFE, HFP, and VDF included in the terpolymeric fluoroelastomers disclosed in Chen '141 and in the THV fluorothermoplastics disclosed in Duchesne. Thus, one cannot differentiate fluoroelastomers from fluorothermoplastics solely on the basis of monomer composition.

If one assumes for TFE (mol. wt. 100) the same molar percentage range as its weight percentage disclosed in Duchesne, i.e., 30-70, the corresponding molar percentage ranges for HFP (mol. wt. 150) and VDF (mol. wt. 64) can be calculated and compared with the molecular weight ranges for these three monomers as recited in instant claim 1. The comparison is shown in the following table:

| Monomer | Mol. Wt. | Duchesne Wt. % | Duchesne Calcd. Mole% | Claim 1 Mole % |
|---|---|---|---|---|
| TFE | 100 | 30-70 | 30-70 | 1-50 or 60-80 |
| HFP | 150 | 5-40 | 3-27 | 10-90 |
| VDF | 64 | 5-55 | 8-86 | 10-90 |

Please note the overlapping ranges of the calculated mole percentages of the component monomers TFE, HFP, and VDF in the THV fluorothermoplastics of Duchesne with the mole percentages for TFE, HFP, and VDF as recited in instant claim 1.

The foregoing discussion of the cited references and attachments can be summarized as follows:

1) Fluoroelastomers and fluorothermoplastics are recognized in the patent prior art and in commercialized polymer technology as distinct classes of materials having substantially differing characteristics.

2) Known commercial fluoroelastomeric materials include Viton® A and Viton® B, whose cured forms are disclosed as useful fluoroelastomers for the compositions of Hartley, as well as the compositions of Lentz, Schlueter, and Eddy.

3) Known commercial fluorothermoplastics include THV materials, an example of which, THV 200A, is employed in the illustrative examples of the composition of the present invention.

4) Although a fluoroelastomer and a fluorothermoplastic differ in their physical characteristics, they can be formed from the same group of monomers, for example, VDF, HFP and TFE , which are the monomeric components, in differing but overlapping weight ratios, of both a THV fluorothermoplastic and Viton® B fluoroelastomer.

Because the combined teachings of the cited prior art references fail to render obvious the applicants' invention, withdrawal of all of the §103(a) rejections of the claims is respectfully requested.

Claims 1-5 and 7-22 remain in this case, whose prompt allowance is earnestly solicited.

Respectfully submitted,

June 9, 2005
Date

Paul Leipold

Enclosures: Attachments P, Q, R, S, T